

## **EXHIBIT D**

**USP 5,572,195 (Heller et al.)**

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| <p><b>Clm 1.</b> An object location and tracking system for tracking <b>infrared transmitters that transmit identifying codes, comprising:</b></p>  | <p>“Infrared transmitters that transmit identifying codes” are transmitters that transmit identifying codes using infrared.</p> <p>“Comprising” means including.</p>   |
| <p>a computer network for passing messages;</p>   | <p>The words in this limitation have their ordinary meanings.</p>  |
| <p>a computer connected to said network, said computer including means for sending and receiving messages over said computer network in a <b>variable-based protocol that implements object identifier variables;</b></p> | <p>A “variable based protocol” is a protocol that uses variables to provide information about the network being managed, allowing for an expandable, open-ended format for providing data. Under a variable based protocol, a management information base (MIB) is established for the specific system being monitored. In the MIB variables are assigned for the information to be communicated. When information is to be communicated the assigned variable representing that information is used. If additional information needs to be conveyed, the MIB is updated so new variables are assigned for the additional information. Messages or signals sent using a variable based protocol vary in content and length depending on the information being conveyed.</p> <p>An “object identifier” is a software data construct used in a computer network in which objects (such as transmitters to be located in an object location system and sensors receiving signals from those transmitters) are assigned identifiers by the network.</p> <p>“Object identifier variables” are variables that vary in content and length based on the information being conveyed and that are used in a variable based protocol to correspond to objects to be tracked or located.</p> <p>This is a “means plus function” limitation.</p> <p>The claimed function is “sending and receiving messages over a computer network.”</p> |

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|  | <p>The disclosed structure is a computer network including infrared transmitters, infrared sensors, external device controllers, concentrators, and control processors or personal computers as set forth in Figs 1 – 5.</p>  |
| <p>a plurality of <b>infrared sensors</b> for receiving transmitted <b>identifying codes</b> from the <b>infrared transmitters</b>, said plurality of infrared sensors providing signals containing the <b>transmitted identifying codes</b>; and</p>  | <p>“Infrared sensors” are sensors that receive infrared transmissions.</p> <p>“Identifying codes” are codes identifying a transmitter.</p> <p>“Infrared transmitters” are transmitters of infrared signals.</p> <p>“Transmitted identifying codes” are identifying codes transmitted by means of infrared signals.</p>  |
| <p>interface circuitry coupling said plurality of <b>infrared sensors</b> to said computer network, said interface circuitry including means for providing to said computer network <b>object identifier variables</b> in the <b>variable-based protocol</b> corresponding to the <b>transmitted identifying codes</b> received from said signals from said plurality of infrared sensors.</p>           | <p>See above definitions of highlighted terms.</p> <p>This is a means plus function limitation.</p> <p>The claimed function is “providing to a computer network object identifier variables in a variable-based protocol corresponding to identifying codes transmitted using infrared and received by infrared sensors.”</p> <p>The disclosed structure is set forth in Figs 1-5 and includes transmitters that employ infrared radiation to transmit codes identifying the transmitters and infrared sensors that receive such transmissions.</p> |
| <p><b>Clm. 13.</b> A method for tracking and locating objects in a system with a computer network, a computer connected to the computer network, <b>infrared sensors</b>, and interface circuitry connecting the computer network to the infrared sensors, the infrared sensors being adapted to receive <b>unique identifying codes</b> from <b>infrared transmitters</b>, comprising the steps of:</p> | <p>See above for definitions of highlighted terms.</p> <p>A “unique identifying code” is an identifying code that identifies one and only one object in a system of multiple objects.</p> <p>“Unique identifying codes from infrared transmitters” are unique identifying codes transmitted using infrared by infrared transmitters.</p>  |

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| providing <b>object identifier variables</b> in the interface circuitry, said object identifier variables adapted for being communicated over the computer network in a <b>variable based protocol</b> ;  | See 1.   |
| receiving in one of the infrared sensors a transmission from one of the infrared transmitters containing a <b>unique identifying code</b> ;   | See 1.   |
| sending the received <b>unique identifying code</b> from the infrared sensor to the interface circuitry;  | See above.   |
| providing the <b>unique identifying code</b> in the interface circuitry to the computer network in association with an <b>object identifier variable</b> ; and  | See above and 1.   |
| receiving in the computer the <b>unique identifying code</b> from the network by accessing its associated <b>object identifier variable</b> .   | See above and 1.   |
| <b>Clm. 18.</b> A method for tracking and locating objects in a system with a computer network, a computer connected to the computer network, <b>infrared sensors</b> , and interface circuitry connecting the computer network to the infrared sensors, the infrared sensors being adapted to receive <b>the unique identifying codes from infrared transmitters</b> , also for providing physical responses and the system having an <b>external device controller</b> , comprising the steps of: | See above for definitions of highlighted terms.<br><br>An "external device controller" is a controller used to control external devices. |
| receiving in one of the <b>infrared sensors</b> a transmission from one of the <b>infrared transmitters</b> containing a <b>unique identifying</b>  | See above for definitions of highlighted terms.  |

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| <b>code;</b>   |   |
| sending the received <b>unique identifying code</b> from the <b>infrared sector</b> to the interface circuitry;  | See above for definitions of highlighted terms. |
| providing the <b>unique identifying code</b> in the interface circuitry to the computer network;   | See above for definitions of highlighted terms. |
| receiving in the computer the <b>unique identifying code</b> from the network;   | See above for definitions of highlighted terms. |
| sending a message from the computer to the <b>external device controller</b> , the message containing an identification of a channel of the external device controller instructing the external device controller to activate the channel, said message sent in response to said <b>unique identifying code</b> provided by the interface circuitry to the computer network: and | See above for definitions of highlighted terms. |
| activating in the <b>external device controller</b> the channel identified in said sending a message step in response to receiving said message sent by the computer.  | See above for definitions of highlighted terms. |

## USP 6, 154, 139

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| <p><b>Clm 1.</b> A method for locating subjects within a tracking environment, the method <b>comprising</b> the steps of:</p>  | <p>“Comprising” means including.</p>   |
| <p>for each <b>subject</b>, providing a <b>TAG</b> capable of transmitting a <b>substantially line-of-sight signal including a unique TAG ID</b> substantially <b>simultaneously</b> with a <b>substantially non-line-of-sight signal</b> also including the unique TAG ID;</p>  | <p>A “subject” is an object or person to be tracked.</p> <p>A “TAG” is a battery-operated badge that contains a transmitter.</p> <p>A “substantially line of sight signal” is a signal such as an infrared signal or a visual light wave signal that will not travel through common building materials that are used to form a room in a building (wood, plaster, drywall, etc.).</p> <p>“Including” means containing.</p> <p>A “unique TAG ID” is an identification that is unique to a specific TAG.</p> <p>“Substantially simultaneously” means at the same time.</p> <p>A “substantially non-line-of-sight signal” is a signal such as a radio frequency signal or an ultrasonic signal that travels through common building materials that are used to form a room in a building.</p> |
| <p>providing an <b>array</b> of receivers distributed within the tracking environment, wherein the array of receivers includes <b>an extended area receiver</b> for receiving a plurality of substantially non-line-of-sight signals and <b>a plurality of limited area receivers</b>, each of the limited area receivers receiving substantially line-of-sight signals;</p> | <p>An “array” is a grouping or arrangement.</p> <p>“An extended area receiver” is a single receiver that receives “substantially non-line-of-sight signals” as defined above.</p> <p>“A plurality of limited area receivers” means numerous receivers that receive “substantially line-of-sight signals” as defined above.</p>   |
| <p>generating an <b>extended area detection packet</b></p>   | <p>An “extended area detection packet” is a set of electrical signals containing the unique</p>  |

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| including the unique TAG ID in response to each received non-line-of-sight signal;  | identification of a tag that is created in response to the receipt of a “non-line-of-sight” signal from the tag.  |
| generating a <b>limited area detection packet</b> including the unique TAG ID in response to each received line-of-sight signal; and  | A “limited area detection packet” is a set of electrical signals containing the unique identification of a tag that is created in response to the receipt of a “line of sight” signal from the tag.   |
| determining the location of each <b>TAG</b> and its associated <b>subject</b> based on the identity of the <b>extended area and limited area receivers</b> for the TAG as represented by its <b>extended area and limited area detection packets</b> .  | See above definitions of highlighted terms.   |
| <b>Clm 5.</b> A system for locating subjects within a tracking environment, the system including:   |   |
| for each <b>subject</b> , a <b>TAG</b> capable of transmitting a <b>substantially line-of-sight signal</b> including a <b>unique TAG ID</b> substantially simultaneously with a <b>substantially non-line-of-sight signal</b> also including the <b>unique TAG ID</b> ;   | Highlighted terms are defined above regarding claim 1.  |
| a <b>receiver assembly</b> including an <b>array</b> of receivers distributed within the tracking environment, wherein the array of receivers includes an <b>extended area receiver</b> for receiving a <b>plurality of substantially non-line-of-sight signals</b> , the receiver assembly generating an <b>extended area detection packet</b> including the <b>unique TAG ID</b> in response to each received <b>non-line-of-sight signal</b> , the array of receivers also including a <b>plurality of limited area receivers</b> , each of the limited area receivers receiving substantially line-of-sight signals, the receiver assembly generating a <b>limited area detection packet</b> including the <b>unique TAG ID</b> | See 1.<br><br>A “receiver assembly” is a combination of receivers, some of which are “extended area receivers” that receive only “non-line-sight” signals such as radio frequency signals, and others of which are “limited area receivers” that receive only “line-of-sight” signals such as infrared signals. |

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| in response to each received line-of-sight signal;  |  |
| a <b>data communications controller</b> coupled to the receiver assembly for collecting the <b>extended area and limited area detection packets</b> ; and   | A “data communications controller” is a device connected to a “receiver assembly” that collects data from the receivers in the receiver assembly consisting of the “extended area” and “limited area” detection packets. |
| a <b>location processor</b> coupled to the controller for receiving the collected detection packets and for determining the location of each TAG and its associated subject based on the identity of the extended area and limited area receivers for the TAG as represented by its extended area and limited area detection packets. | A “location processor” is a computer connected to a “data communications controller.”  |

## USP 5,027,314

| Claim and Claim Element  | Proposed Claim Construction  |
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| <p><b>Clm 1.</b> A system for tracking a number of subjects in a <b>plurality of areas comprising:</b></p>   | <p>A “subject” is an object or person to be tracked.</p> <p>A “plurality” is more than one.</p> <p>An “area” is a physical area inside a structure containing and associated with a receiver.</p> <p>“Comprising” means including.</p>   |
| <p>a plurality of <b>transmitters</b>, wherein at least one transmitter is <b>associated with</b> each of said subjects, each of said transmitters <b>comprising</b> transmission means for transmitting a <b>light based signal representative of an identifying code unique to that transmitter;</b></p> | <p>A “transmitter” is a device that transmits a signal.</p> <p>“Associated with” means attached to related to</p> <p>“A light based signal” means a signal transmitted by means of infrared radiation.</p> <p>“Representative of” means containing.</p> <p>“An identifying code unique to that transmitter” means a code that identifies one and only one transmitter that is making the transmission.</p> <p>This is a means plus function limitation. The claimed function is “transmitting a light based signal representative of an identifying code unique to a transmitter.”</p> <p>The disclosed structure that performs this function is a transmitter containing components performing each of the functions shown as blocks in Fig 2, i.e., a generator, a timer, a clock oscillator, a counter, programmable memory (PROM), an amplifier, and an IR emitter. The PROM is programmed with a specific bit pattern which will generate a unique code in a binary number that is transmitted to an infrared emitter through an amplifier. The emitter converts the electrical signals making up the code of the binary numbers into signals of infrared radiation in a wavelength of from 900 to 10,000 nanometers.</p> |
| <p>a plurality of <b>receivers</b>, wherein at least one of</p>  | <p>A “receiver” is an assembly containing a sensor</p>   |

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| <p>said receivers is <b>associated with each of said areas</b>, each of said receivers comprising a converter for converting a transmitted <b>light based signal</b> to an <b>electrical signal</b> and a <b>validation circuit</b> for processing said electrical signal to determine whether said electrical signals are <b>representative of the unique identifying codes associated with said transmitters</b>; and</p>  | <p>that receives infrared radiation transmitted from transmitters and that synchronizes and decodes the transmitted data.</p> <p>“Associated with each of said areas” means that each receiver is contained within a specific “area”.</p> <p>A “light based signal” is an infrared signal.</p> <p>An “electrical signal” is a signal that uses electricity.</p> <p>A “validation circuit” is an electrical circuit that validates binary numbered code output from infrared transmitters by comparing it with information stored in computer memory.</p> <p>“Unique identifying codes associated with said transmitters” means that each transmitter possesses an identifying code that is not possessed by any other transmitter.</p> |
| <p>processor means, connected to each of said receivers,</p> <p>for recording those <b>electrical signals</b> which are <b>representative of said unique identifying codes</b>,</p> <p>for recording the <b>receiver</b> which determined that such electrical signals are <b>representative of the unique identifying codes</b> associated with said transmitters</p> <p>and for determining in which of said <b>areas</b> said transmitters are located,</p> <p>wherein said processor means comprises <b>scanning means for scanning said receivers</b> and <b>accumulating means for accumulating with respect to each transmitter those areas in which receivers have determined that an electrical</b></p> | <p>See above definitions of highlighted terms.</p> <p>“Scanning” means examining and obtaining information from multiple sources in an ordered sequence.</p> <p>“Accumulating” means forming the result of a mathematical or logical operation.</p> <p>This limitation contains multiple and overlapping means plus function elements covering “processor means,” “scanning means,” and “accumulating means.”</p> <p>The claimed functions of the “processor means” are:</p> <ol style="list-style-type: none"> <li>1. recording electrical signals which are representative of unique identifying codes transmitted by means of IR from transmitters;</li> </ol>  |

signal is representative of the unique identifying code associated with that particular transmitter and

for accumulating a badge count for each accumulated area, said badge count being representative of the number of times a receiver has determined that an electrical signal is representative of the unique identifying code associated with that particular transmitter.

2. recording the identity of the receiver which determined that such electrical signals are representative of the unique identifying codes associated with said transmitters; and
3. determining in which areas the transmitters from which signals were received by the receiver are located.

The disclosed structure of the claimed "processing means" includes a data processor separate from the system's central computer that receives data from multiple receivers that has already been processed by the receivers. The processor validates the multiple receiver data streams and combines the data into a single data stream that it transmits to a separate central processing unit.

The claimed function of the "scanning means" included in the "processor means" is scanning receivers.

The disclosed structure of the claimed "scanning means" consists of receivers that receive transmissions of unique identification information from transmitters via infrared radiation, data processors that validate the identification information and store information in RAM memory, and a central processing unit that receives and stores such information and that periodically cycles through the task of requesting data from the data processors.

The claimed functions of the "accumulating means" included in the "processor means" are:

1. accumulating as to each transmitter those areas from which receivers have determined that a signal has been sent by the transmitter by converting that signal into an electrical signal that is representative of the unique identifying code associated with that transmitter; and

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|   | <p>2. accumulating a badge count for each such area signifying the number of times a receiver has determined that a signal was sent by a specific transmitter.</p> <p>The disclosed structure of the “accumulating means” is a central processing unit that is connected to data processors that are connected to receivers that receive transmissions of unique identifier information from transmitters via infrared.</p>   |
| <p><b>Clm 9.</b> A method for tracking a number of subjects in a plurality of areas in a system wherein at least one transmitter is associated with each of said subjects, each transmitter being capable of transmitting a light based signal representative of an identifying code unique to that transmitter, comprising the steps of:</p> | <p>See above for the definitions of the highlighted terms.</p> <p>This is a “step plus function” limitation in which the claimed tracking method is accomplished by steps of “converting,” “recording,” “determining,” and “accumulating.”</p>  |
| <p>converting, in a receiver, the transmitted light based signal to an electrical signal and validating said electrical signal to determine whether said electrical signal is representative of the unique identifying codes associated with said transmitter;</p>  | <p>The claimed function of the step of “converting” is converting the infrared signal that contains a unique identification code and that is received by the receiver from the transmitter into an electrical signal.</p> <p>The disclosed acts that perform this step are receiving, synchronizing and decoding the received infrared signal by means of infrared sensors as shown in Fig 5 that detect the infrared signals and convert the infrared radiation into an electrical signal, amplifiers that amplify the electrical signals, a computer that is part of the receiver that converts the encoded bit stream to a binary non-return-to-zero bit stream also provides a synchronizing clock signal, and then sending the converted serial data stream to the data processor.</p> |
| <p>recording those electrical signals which are representative of said unique identifying codes;</p>  | <p>The claimed function of the step of “recording electrical signals” is recording the electrical signals, after conversion, that correspond to the unique identifying codes initially received by means of infrared radiation from transmitters</p>  |

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|  | <p>being identified.</p> <p>The disclosed acts that perform this step are transmitting the data stream to from the data processor to the central computing unit where the data are stored.</p>   |
| <p><b>recording the receiver</b> which determined that such electrical signals are representative of the unique identifying codes associated with said transmitters; and</p>   | <p>The claimed function of the step of “recording the receiver” is recording the receiver that received and validated the signal from the transmitter.</p> <p>The disclosed acts that perform this step are recording of code from the receiver’s sensors and amplifiers in the RAM memory of the data processor and the of data to the central processing unit from the data processing computer when the central processing unit requests it from the data processing computer, as shown in Fig 6.</p>   |
| <p>determining in which of said <b>areas</b> said transmitters are located,</p> <p>wherein the recording the receiver and the determining steps <b>comprise</b> the steps of <b>scanning</b> said receivers and</p> <p><b>accumulating</b> with respect to each transmitter those areas in which receivers have determined that an electrical signal is representative of the unique identifying code associated with a particular transmitter and</p> <p>accumulating a <b>badge count</b> for each accumulated area, said badge count being representative of the number of times a receiver has determined that an electrical signal is representative of the unique identifying code associated with the particular transmitter.</p> | <p>The claimed function of the step of “determining” is determining the areas in which specific transmitters are located, including scanning the receivers and accumulating information as to the identities of the transmitter and the number of times a receiver has received a transmission from that specific transmitter.</p> <p>The disclosed acts that accomplish this function are the storage of data regarding receipt of signals from individual transmitters in specific areas in the RAM memory of data processors, the requesting of data by the central processing unit from the data processors of the receivers, the transmission of data from the memory of the data processors to the central processing unit, and the repeated scanning of arrays of the data processors as set forth in Fig. 7.</p> |

**USP RE36,791 (Heller)**

| Claim and Claim Element  | Proposed Construction  |
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| <p><b>Clm 25.</b> A location system for locating objects within a tracking environment using <b>area-detection</b> by receivers that receive electromagnetic transmissions from <b>assigned areas, comprising:</b></p> | <p>“Area detection” means a radiolocation system using receivers configured to detect TAG transmissions only from respective non-overlapping areas, so that signals from an object will be received by only one receiver.</p> <p>“Assigned areas” are areas around receivers that are configured such that the signal from an object within that area is received by only one receiver.</p> <p>“Comprising” means including.</p> |
| <p>for each object, a <b>TAG transmitter</b> for transmitting, at selected intervals, <b>TAG transmissions</b> that include a <b>unique TAG ID</b>;</p>  | <p>A “TAG transmitter” is a transmitter attached to an object to be located.</p> <p>A “TAG transmission” is a transmission from a TAG transmitter.</p> <p>“Unique TAG ID” means an identification that is unique to a specific TAG transmitter, so that every TAG has a different identification.</p>  |
| <p>an array of receivers distributed within the tracking area, with each receiver being configured to receive TAG transmissions from an <b>assigned area of a predetermined size</b>;</p>                              | <p>“Assigned area of predetermined size” means an area surrounding a receiver that is configured in advance so that the signal from an object within that area is received only by one receiver.</p>   |

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| <p>each receiver including a <b>data communications controller responsive to the receipt of a TAG transmission</b> for providing a <b>corresponding area-detection packet</b> that includes the received TAG ID; and</p>   | <p>“Data communications controller” means a programmed controller equivalent to a diskless networked processor that controls the transmission of data over a network.</p> <p>“Responsive to the receipt of a TAG transmission” means providing an output resulting from the receipt of a TAG transmission.</p> <p>A “corresponding area-detection packet” is a packet of information provided by the data communications controller that that corresponds to the TAG transmission received from an assigned area and that includes the identification of the tag contained in the TAG transmission.</p> |
| <p>a <b>location processor</b> for receiving the area-detection packets, and for determining the location of each TAG, and its associated object, <b>based on</b> the identity of the receiver receiving the TAG transmissions for that TAG.</p>   | <p>A “location processor” is a processor that determines location.</p> <p>An “area detection packet” is a packet of information that corresponds to a TAG transmission from an assigned area and that includes the identification of the TAG contained in the TAG transmission.</p> <p>“Based on” means on the basis of.</p> <p>The “identity of the receiver” is the assigned area in which the receiver is located.</p>   |
| <p><b>Clm 39.</b> The location system of claim 25, wherein the receivers are coupled to the <b>location processor</b> by a local area network, with each receiver including a <b>LAN</b> interface, such that the <b>area detection packets</b> are communicated to the location processor over the LAN.</p> | <p>See 25 for the construction of highlighted terms.</p> <p>“LAN” means local area network.</p>   |
| <p><b>Clm 48.</b> A method of locating objects within a tracking environment using <b>area-detection</b> by receivers that receive electromagnetic transmissions from <b>assigned areas, comprising:</b></p>   | <p>See 25.</p>  |

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| for each object, providing a <b>TAG transmitter</b> for, at selected intervals, <b>TAG transmissions</b> that include a <b>unique TAG ID</b> ;  | See 25.   |
| providing an array of receivers distributed within the tracking area, with each receiver being configured to receive <b>TAG transmissions</b> from an <b>assigned area of a predetermined size</b> ;  | See 25.   |
| each receiver being <b>responsive to the receipt of a TAG transmission</b> for providing a <b>corresponding area-detection packet</b> that includes the received TAG ID; and  | See 25.   |
| determining the location of each TAG, and its <b>associated object</b> , based on the identity of the receiver receiving the TAG transmissions for that TAG as represented by the <b>area-detection packet</b> provided by such receiver that received the TAG transmissions. | <p>“Associated object” is the object to which the tag is attached.</p> <p>See 25.</p> |
| a location processor for receiving the <b>area-detection packets</b> , and for determining the location of each TAG, and its associated object, based on the identity of the receiver receiving the TAG transmissions for that TAG.   | See 25.   |

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| <b>Clm. 66</b> A location system for locating objects within a tracking environment using area-detection by receivers that receive transmissions from assigned areas, comprising:   | See 25. |
| for each object, a <b>TAG transmitter</b> for transmitting at selected intervals, <b>TAG transmissions</b> that include a <b>unique TAG ID</b> ;  | See 25. |
| an array of receivers distributed within the tracking area, with each receiver being configured to receive <b>TAG transmissions</b> from an <b>assigned area of a predetermined size</b> ;  | See 25. |
| each receiver including a data communications controller responsive to the receipt of a TAG transmission for providing a <b>corresponding area-detection packet</b> that includes the received TAG ID;                                  |         |
| a location processor for receiving the <b>area-detection packets</b> , and for determining the location of each TAG, and its associated object, based on the identity of the receiver receiving the TAG transmissions for that TAG; and | See 25. |

a local area network, said array of receivers being coupled to the location processor by said local area network, with each receiver including a **LAN** interface, such that the **area detection packets** are communicated to the location processor over said LAN.

See 25 and 39.